

Application No. 10/696,989

MICI 1001-2

In the Drawings:

The attached sheet of drawings includes changes to Fig. 7. This sheet replaces the original sheet. In Fig. 7, element "208" has been amended to read -- 200 --.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

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Application No. 10/696,989

MICI 1001-2

REMARKS

In the Official Action mailed 01 December 2005, the Examiner objected to the drawings. The Examiner reviewed claims 1-43, claims 44-56 having been canceled due to a requirement for restriction. The Examiner has objected to the drawings; indicated that if claim 38 is found to be allowable, claim 41 will be objected to under 37 C.F.R. §1.75; rejected claims 1-4, 6-15, 20, 22-30, 35 and 38-41 under 35 U.S.C. §102(b); rejected claims 5 and 31 under 35 U.S.C. §103(a); rejected claims 16-18, 32 and 33 under 35 U.S.C. 103(a); has rejected claims 19 and 37 under 35 U.S.C. §103(a); has rejected claims 21 and 34 under 35 U.S.C. §103(a); has rejected claim 36 under 35 U.S.C. §103(a); has rejected claim 42 under 35 U.S.C. §103(a); and has rejected claim 43 under 35 U.S.C. §103(a).

Applicant has amended claims 1, 22, 34, 39, 40 and 41, canceled claim 23 and added new claims 57-64. Claims 1-22, 24-43 and 57-64 are now pending.

The Examiner's rejections and objections are respectfully traversed below.

Objection to the Drawings

The Examiner has objected to the drawings because reference characters "301" and "304" have both been used to designate "pre-amplifier." Applicant has amended paragraph [0072] of the specification to address the mistake.

In addition, the Examiner has objected to the drawings because the reference numeral 200 used for the master oscillator in Fig. 7, is not found in the drawings. Rather the drawing mistakenly labels the master oscillator with the reference numeral 208. Applicant has submitted corrected Fig. 7 herewith to correct the mistake.

Accordingly, reconsideration of the objection to the drawings is respectfully requested.

Objection (provisional) to the Claims

The Examiner has noted that if claim 38 becomes allowable, claim 41 will be objected to under 37 C.F.R. §1.75 as being a substantial duplicate thereof. Applicant has amended claim 41, so that it now depends from claim 34 as amended, and therefore complies with 37 C.F.R. §1.75.

Rejection of Claims 1-4, 6-15, 20, 22-30, 35 and 38-41 under 35 U.S.C. §102(b)

The Examiner has rejected claims 1-4, 6-15, 20, 22-30, 35 and 38-41 under 35 U.S.C. §102(b), as being disclosed by Dane et al. ("Design and Operation of a 150 W Near Diffraction-

Application No. 10/696,989

MICI 1001-2

Limited Laser Amplifier with SBS Wavefront Correction" IEEE Journal of Quantum Electronics, pp. 148-163, Vol. 31, No. 1, January 1995.) Applicant has amended independent claims 1 and 22, to clarify that the intracavity loss is set by controlling the reflectivity of a controllable output coupler (as stated in original claim 23 now canceled), and requests reconsideration in light of the amendment.

Claims 2-4, 6-15 and 20 depend from claim 1 as amended, and are not anticipated for at least the same reasons, and because of the unique combinations recited. For example, with respect to claim 2, the Examiner identifies the gain medium of the amplifier in Dane et al. as the gain medium of a resonator of claim 1, in which the relaxation oscillation pulse is generated. This is incorrect. The gain medium in the oscillator that generates the single frequency pulse in Dane et al. is described as Nd:YLF. The Examiner's position that the Ng:glass gain medium used in the amplifier is the gain medium in which the relaxation oscillation pulse is generated is mistaken. Other mistakes arise from this characterization of the multipass amplifier as a resonator that need not be reviewed here for the purpose of the rejection based on alleged anticipation.

Claims 24-30, 35 and 38-41 depend from claim 22 as amended, and are not anticipated for at least the same reasons, and because of the unique combinations recited. Applicant has amended claims 39 and 40, for consistency with amended claim 22.

Fundamentally, Applicant notes that the Examiner has mistakenly characterized the combination of the single frequency oscillator and the multipass amplifier in Fig. 1 of Dane et al. as the resonator of claims 1 and 22, commenting that "it should be noted that a resonator only need only to have a characteristic frequency throughout." Applicant does not agree with this definition of a resonator, and does not believe that it is supportable in the prior art.

Fig. 1 of Dane et al. illustrates the layout of a multipass amplifier that receives a seed pulse from the single frequency oscillator labeled in the figure. The multipass amplifier of Dane et al. cannot oscillate, and therefore does not act as a resonator. The seed pulse in this configuration from the single frequency oscillator passes only two times through this amplifier ring. Without an externally supplied beam to amplify, the multipass amplifier of Dane et al. would emit no laser beam. Furthermore, claims 1 and 22 explicitly recite the formation of a relaxation oscillation pulse in the resonator. There is no such pulse generated in the gain medium of the amplifier. Therefore in connection with positions that these claims are

Application No. 10/696,989

MICI 1001-2

anticipated, the Examiner's references to Fig. 1 of Dane et al. and its components as a resonator are mistaken.

Accordingly, reconsideration of the rejection of claims 1-4, 6-15, 20, 22-30, 35 and 38-41 in view of the amendments, is respectfully requested.

Rejection of Claims 5 and 31 Under 35 U.S.C. §103(a)

The Examiner has rejected claims 5 and 31 under 35 U.S.C. §103(a) as being unpatentable over Dane et al. ("Design and Operation of a 150 W Near Diffraction-Limited Laser Amplifier with SBS Wavefront Correction") in view of Sokol (US 6,384,368).

Claims 5 and 31 depend from claims 1 and 22, respectively, and are patentable for at least the same reasons, and because of the unique combinations recited.

Accordingly, reconsideration of the rejection of claims 5 and 31 is respectfully requested.

Rejection of Claims 16-18, 32 and 33 under 35 U.S.C. §103(a)

The Examiner has rejected claims 16-18, 32 and 33 under 35 U.S.C. §103(a) as being unpatentable over Dane et al. ("Design and Operation of a 150 W Near Diffraction-Limited Laser Amplifier with SBS Wavefront Correction") in view of Ammann et al. (US 3,836,866).

Claims 16-18 depend from claim 1 as amended, and are patentable for at least the same reasons, and because of the unique combinations recited.

Claims 32 and 33 depend from claim 22 as amended, and are patentable for at least the same reasons, and because of the unique combinations recited.

Accordingly, reconsideration of the rejection of claims 16-18, 32 and 33 in view of the amendments is respectfully requested.

Rejection of Claims 19 and 37 under 35 U.S.C. §103(a)

The Examiner has rejected claims 19 and 37 under 35 U.S.C. §103(a) as being unpatentable over Dane et al. ("Design and Operation of a 150 W Near Diffraction-Limited Laser Amplifier with SBS Wavefront Correction") in view of Lee et al. (US 4,803,694).

Claims 19 and 37 depend from claims 1 and 22, respectively, and are patentable for at least the same reasons, and because of the unique combinations recited.

Accordingly, reconsideration of the rejection of claims 19 and 37 in view of the amendments is respectfully requested.

Application No. 10/696,989

MICI 1001-2

Rejection of Claims 21 and 34 under 35 U.S.C. §103(a)

The Examiner has rejected claims 21 and 34 under 35 U.S.C. §103(a) as being unpatentable over Dane et al. ("Design and Operation of a 150 W Near Diffraction-Limited Laser Amplifier with SBS Wavefront Correction") in view of Smith et al. (US 6,282,224). Applicant respectfully requests reconsideration on two grounds. First, Applicant submits that the *prima facie* case is incomplete, because the combination does not include all the limitations of the claims. Second, Applicant submits that even if all the limitation in the claims were found in the combination, the combination would render the primary reference inoperable for its intended purpose, and is therefore improper.

Claim 21 depends from claim 1 as amended, and is patentable for at least the same reasons, and because of the unique combination recited. Applicant has added new claim 57 however, to express claim 21 as originally filed in independent form.

Likewise, applicant has amended claim 34 to independent form, incorporating the subject matter of original claim 22.

Claims 21, 57 and 34 call into issue the Examiner's mistaken characterization of the combination of the single frequency oscillator and the multipass amplifier in Fig. 1 of Dane et al. as the resonator of claims 1 and 22, as mentioned above.

The Examiner states that the step of inducing intracavity loss in the resonator of original claim 1, and now in claim 57, is met by the operation of the single frequency oscillator, rather than the amplifier. The oscillator is a relaxation pulse seeded resonator, where cavity loss is induced, a relaxation oscillation pulse arises, and the Q-switch is thrown in response to detection of the relaxation pulse. However, the configuration of the relaxation oscillation pulse seeded oscillator in Dane et al. is not described. See, Dane et al., page 150 II Optical Architecture: D. Single Frequency Oscillator, 1st paragraph. Applicants Dane and Hackel on the present application are in fact co-authors of the Dane et al article, and can represent that the single frequency oscillator used in the system of Dane et al. was configured as a linear resonator, like that shown at page 12 of the Dane et al., January, 1991, poster presentation displayed at Snowbird, Utah, and which is already in this record.

As to claim 21 (which is now presented as independent claim 57), the Examiner takes the position that "Dane discloses all that pertains to claim 1." (Office Action, page 15). The Examiner acknowledges that Dane et al. does not disclose components acting as an optical diode.

Application No. 10/696,989

MICI 1001-2

The Examiner relies on Smith et al. to suggest such components. However, Applicant submits that Dane et al. does not disclose a ring configured resonator that is relaxation oscillation pulse seeded, as required by the claim, and therefore the *prima facie* case is incomplete.

The Examiner does not explicitly describe what components of Dane et al. correspond to the ring configured oscillator. However, it is apparent from the discussion that the Examiner is relying on the configuration of the multipass amplifier as the ring configuration of the resonator in the claims.

This reading of the combination of the single frequency oscillator and the multipass amplifier as the "resonator" of original claim 1 (now in claim 57) is mistaken, not only because the amplifier cannot be fairly characterized as a resonator at all, but also because the claims require the build up of the relaxation oscillation pulse to be within the resonator. Although the multipass amplifier is configured as a "ring" which a pulse traverses twice before being emitted, there is no relaxation oscillation in the gain medium within the amplifier ring of Dane et al. Thus, there is no resonator with a ring configured optical path in Dane et al. Claims 21 and 57 therefore distinguish over Dane et al. by at least the requirement of a ring configured resonator.

Smith et al. does describe a ring configured oscillator, and components acting as an optical diode. The Examiner suggests that it would be obvious to insert an optical diode in the ring configured amplifier of Dane et al. "to not waste pump energy." However, the combination would render the amplifier of Dane et al. inoperable. In Dane et al., the amplifier ring is configured so that the pulse traverses the ring counterclockwise (with reference to Fig. 1), is reflected by the SBS phase conjugator, and then traverses the ring in a clockwise direction before it is emitted. An optical diode would prevent either the clockwise or the counterclockwise pass, and render the amplifier inoperable. Accordingly, the Examiner's combination is improper as to claims 21 and 57.

Claim 34 is similar to claim 57, and patentable for the reasons discussed with respect to claim 57.

Accordingly, reconsideration of the rejection of claim 21 as amended, claim 57 (corresponding to original claim 21), and claim 34 as amended, is respectfully requested.

Application No. 10/696,989

MICI 1001-2

Rejection of Claim 36 under 35 U.S.C. §103(a)

The Examiner has rejected claim 36 under 35 U.S.C. §103(a) as being unpatentable over Dane et al. ("Design and Operation of a 150 W Near Diffraction-Limited Laser Amplifier with SBS Wavefront Correction") in view of Caprara et al. (US 6,198,756).

Claim 36 depends from claim 22, as amended, and is patentable for at least the same reasons, and because of the unique combination recited.

Accordingly, reconsideration of the rejection of claim 36 as amended is respectfully requested.

Rejection of Claim 42 under 35 U.S.C. §103(a)

The Examiner has rejected claim 42 under 35 U.S.C. §103(a) as being unpatentable over Dane et al. ("Design and Operation of a 150 W Near Diffraction-Limited Laser Amplifier with SBS Wavefront Correction") in view of Smith et al. (US 6,282,224) and Ammann et al. (US 3,836,866). Applicant respectfully requests reconsideration, because the combination does not include all the limitations of the claim, so the *prima facie* case is incomplete, and because the combination would render the primary reference (Dane et al.) inoperable.

In particular, Examiner relies upon Dane et al. to teach a resonator configured as a ring, and a controller producing a relaxation oscillation pulse within the ring. As discussed above, this is mistaken. The Examiner suggests that the relaxation pulse is produced in the gain medium of the amplifier. This position is mistaken as discussed in detail above.

In addition, there is no description in Dane et al. of an output coupler on a resonator that comprises a polarizing beam splitter, having a reflectivity that is adjustable by controlling polarization of the beam within the resonator, to set a pulse width as required in the claim. The Examiner cites the Pockels cell in Fig. 1 of Dane et al., described in II. Optical Architecture: C. Operation With an SBS Phase Conjugator, 1st paragraph, lines 16-19. Applicant points out that the Examiner is mistaken in this respect. The Pockels cell identified by the Examiner is outside the ring of the amplifier, and not part of the single frequency oscillator. It is used to prevent reflections of the amplified pulse from retracing the optical path to the oscillator, where such reflections could damage the components. Accordingly, such Pockels cell has nothing to do with polarization within the ring configured amplifier, and nothing to do with output coupling, and nothing to do with controlling pulse width as required in claim 42.

Application No. 10/696,989

MICI 1001-2

In addition, the Examiner suggests that the teaching of Ammann could be applied to detection of a relaxation oscillation pulse in the amplifier. However, no such pulse is generated in the amplifier of Dane et al., so the addition of Ammann does not overcome the fact that Dane et al. does not describe a ring configured resonator in which a relaxation oscillation pulse is generated.

Furthermore, inserting an optical diode as taught by Smith into the ring configured amplifier would render the amplifier of Dane et al. inoperable, as discussed above in connection with claims 21 and 34.

Accordingly, reconsideration of the rejection of claim 42 is respectfully requested.

Rejection of Claim 43 under 35 U.S.C. §103(a)

The Examiner has rejected claim 43 under 35 U.S.C. §103(a) as being unpatentable over Dane et al. ("Design and Operation of a 150 W Near Diffraction-Limited Laser Amplifier with SBS Wavefront Correction") in view of Smith et al. (US 6,282,224). Applicant respectfully requests reconsideration, because the combination does not include all the limitations of the claim, so the *prima facie* case is incomplete, and because the combination would render the primary reference (Dane et al.) inoperable.

As discussed in detail above with respect to claims 21, 34 and 57, Dane et al. does not describe a relaxation oscillation pulse seeded resonator configured as a ring. Accordingly, the Examiner's *prima facie* case fails to include at least the limitations of claim 43, reading "building up gain ... until formation of a relaxation oscillation pulse in the resonator."

Furthermore, there are no components in the amplifier of Dane et al., which suppress oscillation on one direction. The Examiner relies upon Smith et al. to suggest this step. However, to insert the optical diode of Smith et al. in the amplifier ring of Dane et al. would render Dane et al. inoperable.

Accordingly, reconsideration of the rejection of claim 43 as amended is respectfully requested.

New Claims 57-64

New claims 57-64 are added. Claim 57 has been discussed above. Claims 58-61 depend from claim 57. New claims 62-64 depend from claim 34 as amended.

Application No. 10/696,989

MICI 1001-2

Dependent claims 57-60 and 62-64 relate to the use of etalons as described in the specification at paragraph [0050] starting at page 11, line 30, and at paragraph [0057] starting at page 14, line 28.

CONCLUSION

It is respectfully submitted that this application is now in condition for allowance, and such action is requested.

The Commissioner is hereby authorized to charge any fee determined to be due in connection with this communication, or credit any overpayment, to our Deposit Account No. 50-0869 (MICI 1001-2).

Respectfully submitted,



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Title: Self-Seeded Single-Frequency Solid-State Ring Laser, and Single-Frequency Laser
Peening Method and System Using Same
Application No. 10/696,989
Attorney Docket No. MICI 1001-2
ANNOTATED SHEET SHOWING CHANGES

Application No. 10/696,989

Attorney Docket No. MICI 1001-2

ANNOTATED SHEET SHOWING CHANGES

6/7

